Remarks

Claims 1-19 are pending in the application. By this amendment, claims 1, 5, 17-19 are amended; claim 4 is cancelled (since the limitations thereof have been incorporated into claim 1 from which it depended); and claims 20 and 21 are newly presented. Applicant requests reconsideration and allowance in view of the following remarks.

Specification

The specification is objected to because the Abstract is too long. A new Abstract is presented which should overcome the objection.

Claim Rejection

Claims 1-19 are rejected under 35 U.S.C. § 103(a) based on Dahlen, U.S. 6,131,705, in view of Berwanger, U.S. 6,016,892. According to the Office Action with respect to claims 1 (independent) through 5, Dahlen discloses a device essentially as recited in the claims, including a driving unit, but not an interconnecting component that interconnects the driving unit and the object with a friction fit between the driving unit and the interconnecting component. However, according to the Office Action, Berwanger discloses an interconnecting component in an adjustment arrangement for a brake actuator as described in the claims. Therefore, according to the Office Action, it would have been obvious to combine Berwanger with Dahlen to obtain the claimed invention "because an interconnecting component between the driving unit and the object will provide resistance to eliminate any unwanted movement and in turn, results in incrementally reestablishing the preferred clearance spacing between the object (piston) and the friction member." Applicant traverses the rejection because Berwanger does not, in fact, disclose the claim-recited features for which the Examiner is relying on it.

According to the claimed invention, e.g., as in the exemplary, non-limiting context of a brake actuator as disclosed in the application, a driving unit (e.g, sleeve 14) is provided which can drive an object (e.g., piston 4, which is used to compress brake pads to slow a vehicle). In the disclosed embodiment, the sleeve 14, acting through the friction joint with the interconnecting component 21 and the abutting shoulders of the interconnecting component and the piston, pushes (drives) the piston to its retracted position (rearward position 10, which is to

the right in the Figures). (Brake fluid introduced under pressure into chamber 24 is what drives the piston to its forward position 9.) More particularly, spring member 16 exemplarily bears against fixed counter component 20 at one end and pushes against another counter component 19 at its opposite end, which counter component 19 is connected to the sleeve (driving unit) 14. Therefore, when braking pressure is released, the spring pushes the sleeve to its rearward, retracted position (i.e., to the right in the Figures). The friction joint between the sleeve and the interconnecting component is strong enough that the sleeve "pulls" the interconnecting component along with it as the sleeve is moved to the retracted position. In turn, the shoulder 25 of the interconnecting component exemplarily bears against the shoulder 26 of the piston so that as the interconnecting component moves with the sleeve toward the sleeve's retracted position, the piston moves along with them (the sleeve and the interconnecting component).

Conversely, when brake fluid is introduced into the chamber 24 under pressure, the object (the piston) is acted on directly (by the brake fluid) toward its actuated position (forward position 9, i.e., to the left in the Figures). As the piston moves toward its forward position, its shoulder pushes against the interconnecting component's shoulder, thus pulling the interconnecting component along with the piston toward the piston's forward position. Furthermore, the friction joint between the interconnecting component and the sleeve is strong enough that the interconnecting component "pulls" the sleeve along with it as the interconnecting component is moved by the piston toward the piston's forward position. It should be noted that as the piston (the object), and hence the interconnecting component, is moved forward (i.e., to the left in the Figures), the spring will be compressed between the counter component 20 and the counter component 19, which moves forward with the sleeve. The force of compression, acting through the friction joint between the sleeve and the interconnecting component, acts on the interconnecting component toward the rearward position of the piston while the piston itself is being acted on by the brake fluid toward its forward position; the shoulder-to-shoulder abutment, however, prevents the piston and the interconnecting component from moving relative to each other – i.e, they are locked against displacement – when they are acted on in such opposite directions, as recited in the claims.

Furthermore, and still within the exemplary, non-limiting context of a brake actuator, the claimed apparatus allows the position of the piston (i.e., the object) to adjust automatically to

compensate for thinning brake pads as they become worn. In particular, when the piston is pushed toward its actuated position (forward position 9, to the left in the Figures), the sleeve (i.e., the driving unit) moves with it, due to the friction between the interconnecting component and the sleeve, until the end of the sleeve abuts a travel limit (e.g., surface 28 of the counter stop 20), which prevents the sleeve from moving any further with the piston. As the brake pads get thinner and thinner due to wear, however, the piston must move further and further (i.e., to the left in the Figures) to activate the brakes. Therefore, continued application of actuating force to the piston overcomes the force of friction between the interconnecting component and the sleeve, which will be prevented from moving further by the travel limit, and the piston slides forward relative to the sleeve. Thus, as recited in the claims, the friction joint is configured "to enable displacement of the driving unit (14) and the object (4) relative to each another under the influence of a certain lowest [viz., minimal] force." Accordingly, as the brake pads get thinner, the at-rest position of the piston gradually moves forward so the amount of incremental brake fluid that needs to be pumped into the chamber 24 to actuate the brakes remains constant over time.

With respect to Berwanger, which is also directed to a configuration for automatically adjusting the position of a brake actuator to compensate for wearing brake pads, the Examiner construes the "adjuster tube" 17 as the claim-recited interconnecting component but he never specifically identifies anything in Berwanger as constituting the driving unit or the object in connection with which the interconnecting component bears the claim-recited relationships. Given the first-blush similarity between the drawings in the Application and in Berwanger, Applicant assumes the Examiner is relying on the sleeve 15 in Berwanger as constituting the claim-recited driving unit. In this regard, however, it is important to note that the arrangement of the components in Berwanger is actually inverted vis-à-vis the arrangement of the components in the exemplary embodiment disclosed in the application (and the arrangement of the components in Dahlen). In the disclosed embodiment, the piston (i.e, the object) surrounds and moves relative to the fixed central bolt 18. In Berwanger, in contrast, the piston assembly is centrally located within and surrounded by the bushing 11, the sleeve 15 (i.e., the presumptive driving unit), and the adjuster tube (i.e., an interconnecting component according to the Examiner). Applicant raises this point not because the claims specify any particular inner/outer positional

relationship, but rather to make sure the Examiner understands the Berwanger device properly so that the claim language can be compared against it properly

More particularly, as shown in Figure 1 or Figure 3 of Berwanger,[1] bushing 11, which is fixed within a cavity in housing 7, surrounds and supports the piston/sleeve/adjusting tube assembly. A compression spring located between the inner end of the piston and a stop 39/39a (Figure 1) or 39 (Figure 3), which is connected to or integral with the sleeve 15, biases the piston into the cavity (i.e., toward the left in the Figures), while the necked-down, "swaging restriction" portion 16 of the bushing prevents the spring from pushing the sleeve/adjusting tube assembly out of the bushing. When hydraulic fluid is introduced into the region 8, it flows between the wall of the housing cavity and the end of the piston (the leftmost end as shown in the Figures), overcomes the biasing force of the spring, and causes the piston to extend (i.e., move to the right as shown in the Figures); the compressive force in the spring is not, however, strong enough to overcome the restriction to movement provided by the swaging restriction. When hydraulic pressure is released, the spring returns the piston to its non-actuated position (toward the left in the Figures), with return travel of the piston being limited by the head of the piston engaging, e.g., the stop (particularly when the piston assembly has been automatically adjusted outward, as addressed below) or, possibly (e.g., if the brake pads are new), the inner end of the piston contacting the wall of the housing cavity.

As the brake pads wear down and get thinner, the piston needs to extend further and further to actuate the brakes; eventually, the piston will extend far enough that piston surface 21 abuts rim 23 at the end of the sleeve 15. The hydraulic force on the piston is large enough to force the sleeve/adjuster tube assembly through the swaging restriction 16, and the adjuster tube 17 will be crimped down against the sleeve 15 as the assembly is forced through the restriction. Thus, as the sleeve/adjuster tube assembly progresses incrementally from the busing 11, the non-actuated position of the piston head will also progress incrementally – as noted above, return travel of the piston is limited – and amount of incremental brake fluid that needs to be pumped into the region 8 to actuate the brakes remains constant over time.

[1] All embodiments in Berwanger operate on the same basic principle.

When Berwanger is properly understood, it is clear that Berwanger does not disclose the features for which the Examiner is relying on it. Simply put, the Examiner is relying on Berwanger for disclosure of an interconnecting component (Berwanger's adjusting tube 17) that interconnects a driving unit (e.g, sleeve 14 in the instant application) and an object (e.g., the piston) that is driven by the driving unit, but the adjusting tube 17 in Bergwanger is not, in fact, an interconnecting unit as so recited in the claim. The adjusting tube 17 in Berwanger lies between and gets swaged between the sleeve 15 and the bushing 11, but neither the sleeve nor the bushing constitutes either the object or the driving unit as recited in the claims. In Berwanger, the piston – not the bushing 11 or the sleeve 15 – is analogous to the claim-recited object, but the sleeve 15 – presumably what the Examiner has in mind as constituting the claim-recited driving unit – does not drive it by any distance. Rather, in Berwanger, hydraulic fluid acts directly on the piston to extend it, and the spring acts directly on the piston to retract it when hydraulic pressure is released. But the spring in Berwanger does not constitute the claim-recited driving unit since Berwanger's spring doesn't satisfy the claim requirements as to the positional relationship between the object, the driving unit, and the interconnecting unit or as to a friction joint being formed between the driving unit and the interconnecting unit.

Nor does Berwanger's sleeve 15 satisfy the claim requirement that the driving unit drives the object "when the driving unit (14) is displaced from the first position to the second position (12, 13)[.]" In Berwanger, the sleeve – restrained by the swaging restriction 16 – remains stationary and the spring drives the piston back to its retracted position. Furthermore, the nature of the contact between the adjustment tube 17 and the sleeve 15 in Berwanger where the adjustment tube is crimped down by the swaging restriction 16 – presumably what the Examiner has in mind as constituting the claim-recited friction joint – has nothing to do with enabling the driving unit to move relative to the object under a certain amount of force as recited in the claims (which is as exemplarily explained above). Rather, in Berwanger, the adjustment tube 17 and the sleeve 15 remain longitudinally stationary with respect to each other (although more and more of the adjustment tube comes into contact with the sleeve as the adjustment tube/sleeve assembly progresses outwardly through the swaging restriction 16). Therefore, it cannot be said that any relative motion of any of the parts in Berwanger can be attributed to the friction joint enabling it under the influence of a certain lowest (minimal) force, as required by the claim.

Thus, when Berwanger is properly considered, it is evident that none of the components disclosed in Berwanger satisfy any of the claim-recited relationships. Accordingly, no modification of Dahlen in view of Berwanger (if one of skill in the art would have even been inclined to modify Dahle but for Applicant's teachings) can yield the claimed invention. Accordingly, Applicant traverses the rejection and requests that it be withdrawn.

Nevertheless, in an effort to expedite prosecution and advance this application to allowance, Applicant has amended each of the independent claims to specify that there is an amount of play between the interconnecting component and the object, which is sufficient to prevent undesired force (e.g., vibration force) from being transferred from the object to the interconnecting component and to the friction joint, as previously recited in claim 4 (now cancelled). Because proper analysis of Berwanger as above reveals that none of the components disclosed therein satisfies the various claim-recited interrelationships of components according to the invention, it follows all the more strongly that Berwanger does not disclose that feature, either. Accordingly, Applicant submits that claims 1-19 are clearly patentable over the combination of Dahlen in view of Berwanger,[2] and Applicant respectfully requests that the rejection be withdrawn.

Furthermore, new claim 20 presents the subject matter of original claim 5 in independent format, and new claim 21 is the same as original claim 1 but with recitation that the interconnecting component solely interconnects the driving unit and the object. The explanation set forth with respect to Dahlen and Berwanger applies with respect to these claims, too, so Applicant submits that claims 20 and 21 are also clearly allowable over the combination of Dahlen and Berwanger.

Thus, in view of the foregoing, Applicant submits that all claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

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[2] Although claims 1-19 are all rejected based on Dahlen in view of Berwanger in a single rejection, the Examiner provides separate analysis for claims 1-5; claim 6; claims 7 and 8; claim 9; claims 10-13; claims 14 and 15; claim 16; claim 17; claim 18; and claim 19. The analysis above, however, applies to all claims with equal force. Accordingly, Applicant requests that the single rejection of all claims be withdrawn without addressing each specific sub-group of the claims individually.

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The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, referencing Attorney Docket No.: 6730.059.PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner may directly contact the undersigned by phone to further the discussion.

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